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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/801,072	03/15/2004	Yan R. Kucherov	13693.22.1	1261

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EXAMINER

DIAMOND, ALAN D

ART UNIT	PAPER NUMBER
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1753

DATE MAILED: 04/27/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/801,072

Applicant(s)

KUCHEROV ET AL.

Examiner

Alan Diamond

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 26 January 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-36 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 17-21 and 34 is/are allowed.
- 6) ☒ Claim(s) 1-10, 22-33, 35 and 36 is/are rejected.
- 7) ☒ Claim(s) 11-16 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 15 March 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 10012004, 01262005.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Comments

1. The 35 USC 112, second paragraph, rejection of the instant claims has been overcome by Applicant's amendment of the claims.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1-6, 8-10, 22-27, 29-33, 35, and 36 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over JP 2001-217469, herein referred to as JP '469. It should be noted that none of Serials Nos. 10/307,241, 09/519,640, and 60/123,900 fully supports the instantly claimed subject matter. Accordingly, the instant claims, at best, have an effective U.S. filing date of March 13, 2003. JP '469 has a 102(b) date of August 10, 2001.

JP '469 teaches a thermoelectric conversion element having the structure p/n/p/n/p/n/p/n/p/n/p, wherein, when the hot heat exchange surface is at the left of the device, it is the Examiner's position that the first n from the left reads on the instant

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emitter region, the second p from the left reads on the instant barrier layer, and the second n from the left reads on the instant semiconductor gap region (see Figure 1A). It is the Examiner's position that said barrier layer inherently provides a potential barrier and Fermi-level discontinuity between the emitter region and gap region. When the first p from the left reads on the instant emitter region, the first n from the left reads on the instant barrier layer, and the second p from the left reads on the instant semiconductor gap region (see Figure 1A). With respect to claim 31-33, JP '469's thermoelectric conversion element has plural n/p/n. The last p at the right of Figure 1A reads on the p_c in claim 31 and the p_i in claim 33. The last p (at the right) reads on the instant collector region, and JP '469 teaches the use of ohmic contacts (i.e., electrodes) as here claimed, and an external load (see paragraph 0053). It is the Examiner's position that said gap region inherently is at least 1, e.g., at least 5, carrier scattering lengths wide when JP '469's device is prepared using the materials in its example at paragraphs 0051-0054. Since JP '469 teaches the limitations of the instant claims, the reference is deemed to be anticipatory.

In addition, the presently claimed emitter region, semiconductor gap, barrier layer, scattering lengths, and requirement that the barrier layer provides a potential barrier and Fermi-level discontinuity between the emitter region and gap region would obviously have been present once JP '469's thermoelectric device has been provided. Note In re Best, 195 USPQ at 433, footnote 4 (CCPA 1977) as to the providing of this rejection under 35 USC 103 in addition to the rejection made above under 35 USC 102.

Claim Rejections - 35 USC § 103

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5. Claims 7 and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over JP 2001-217469, herein referred to as JP '469. It should be noted that none of Serials Nos. 10/307,241, 09/519,640, and 60/123,900 fully supports the instantly claimed subject matter. Accordingly, the instant claims, at best, have an effective U.S. filing date of March 13, 2003. JP '469 has a 102(b) date of August 10, 2001.

JP '469 teaches a thermoelectric conversion element having the structure p/n/p/n/p/n/p/n/p, wherein, when the hot heat exchange surface is at the left of the, device, it is the Examiner's position that the first n from the left reads on the instant emitter region, the second p from the left reads on the instant barrier layer, and the second n from the left reads on the instant semiconductor gap region (see Figure 1A). It is the Examiner's position that said barrier layer inherently provides a potential barrier and Fermi-level discontinuity between the emitter region and gap region. When the first p from the left reads on the instant emitter region, the first n from the left reads on the instant barrier layer, and the second p from the left reads on the instant semiconductor gap region (see Figure 1A). The last p (at the right) reads on the instant collector region, and JP '469 teaches the use of ohmic contacts (i.e., electrodes) as here claimed, and an external load (see paragraph 0053). JP '469 teaches that thermoelectric devices can be used for cooling, i.e., for refrigeration (see paragraph 0007). JP '469 teaches the limitations of the instant claims other than the difference which is discussed below.

JP '469 does not specifically require using its device for refrigeration conversion. However, it would have been obvious to one of ordinary skill in the art at the time the

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invention was made to have used JP '469's device for refrigeration because such is clearly within the scope of JP '469's disclosure.

Response to Arguments

6. Applicant's arguments filed January 26, 2005 have been fully considered but they are not persuasive.

Applicant cites Verdegaal Bros v. Union Oil Co. of California and argues that the PTO has not satisfied the requirement for establishing that any of the rejected claims has been anticipated by the prior art. However, the Examiner maintains that JP '469 anticipates the instant claims.

Applicant argues that the Office Action has not satisfied the requirement of establishing a case of *prima facie* obviousness. However, the Examiner maintains that said Office Action has satisfied the requirement of establishing a case of *prima facie* obviousness.

Applicant cites paragraph 0047 in the instant specification and argues that in order to have a Fermi-level discontinuity, the barrier layer must be "formed to create a potential barrier for hot electron injection, and provide a discontinuity of the Fermi levels"; that the "addition of any p-type layer on an n-type gap creates a potential barrier, but only high enough concentration of p-type carriers ensures a discontinuity of the Fermi-level"; and that "positioning of the Fermi level relative to the bottom of the conduction band as a function of donor and acceptor concentration is described by Kane's diagram". Applicant argues that "the presently recited barrier layer is different from that of just any alternating layered materials (e.g., n/p/n or p/n/p)." Applicant

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argues that JP '469 has no teaching of the instant Fermi-level discontinuities, and is "completely devoid of teaching anything related (explicitly or implicitly) to barrier layers providing Fermi-level discontinuities between emitter regions and gap regions."

However, these arguments are not deemed to be persuasive because JP '469 prepares thermoelectric devices using p-type and n-type layers. JP '469 teaches a thermoelectric conversion element having the structure p/n/p/n/p/n/p/n/p, wherein, when the hot heat exchange surface is at the left of the device, it is the Examiner's position that the first n from the left reads on the instant emitter region, the second p from the left reads on the instant barrier layer, and the second n from the left reads on the instant semiconductor gap region (see Figure 1A). For example, in Example No. 1 in Table 2, the p-type layers are $\text{Si}_{0.95}\text{Ge}_{0.05}$ doped with 0.3 at% boron (B) (see also paragraph 0051). It is the Examiner's position that the barrier layer formed from said p-type $\text{Si}_{0.95}\text{Ge}_{0.05}$ doped with 0.3 at% boron inherently provides a potential barrier and Fermi-level discontinuity between the emitter region and gap region. Applicant has not provided any evidence that it does not provided a potential barrier and Fermi discontinuity.

Allowable Subject Matter

7. Claims 11-16 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

8. Claims 17-21 and 34 are allowed.

Conclusion

9. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Alan Diamond whose telephone number is 571-272-1338. The examiner can normally be reached on Monday through Friday, 5:30 a.m. to 2:00 p.m. ET.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen can be reached on 571-272-1342. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should

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you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Alan Diamond
Primary Examiner
Art Unit 1753

A handwritten signature in black ink, appearing to read 'Alan Diamond', with a stylized, cursive script.

Alan Diamond
April 22, 2005